CEREAL RUST BULLETIN

Final Report

August 14, 1996

From:

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(In cooperation with the Minnesota Agricultural Experiment Station)

- Wheat stem rust was widespread throughout the U.S. wheat growing area in 1996. The most significant damage was caused in the northern soft red winter wheat area east of the Mississippi River.
- Wheat leaf rust was widespread in winter wheat throughout the U.S., but incidence and severity were less than normal because of the dry conditions in the southern plains and less overwintering in the central plains.
- Wheat stripe rust in the Pacific Northwest was effectively controlled by adult plant resistance in most varieties, although susceptible varieties were heavily infected and losses were more severe than last year.
- Oat stem rust in 1996 was very light throughout the oat-growing area, which may be due to the decline in oat production.
- Oat crown rust was severe throughout much of the northern oat-growing area where the buckthorns provided the initial inoculum for rust infection.
- Barley stem rust did not reach damaging levels in the northern plains due to the low levels of the barley attacking race, QCCJ, farther south.
- Barley leaf rust was found throughout the northern barley-growing area, but severities were too low to affect yields.
- Barley stripe rust is now firmly established throughout the Pacific Northwest where the climate is most favorable for its development. Fungicide applications were needed to prevent losses in yield and quality.

Most of the small grains in the northern Great Plains are in good condition and near normal in maturity. Scab is lighter than last year in western Minnesota and eastern North Dakota spring wheat fields. Barley, oat and winter wheat harvest has begun in northeastern North Dakota and northeastern Montana.

Wheat stem rust. This year, wheat stem rust was found scattered in plots and fields throughout the southern Plains and the lower Mississippi Valley wheat-growing area. In all of these areas, losses to wheat stem rust were minimal, but these fields did provide stem rust inoculum for susceptible wheats and barleys farther north.

During 1996, wheat stem rust overwintering sites were found in southern Texas, southern Louisiana and southern Illinois. During the first week in April, traces of stem rust were found in winter wheat fields southwest of Houston and southern Louisiana. Stem rust development in southern Texas and Louisiana in 1996 was less than in 1993, the last year with significant wheat stem rust in the U.S. 1993 and other recent years, with greater than average stem rust, generally had warmer late winter and early spring weather with more rainfall than occurred in 1996. In late April, traces of wheat stem rust were observed on susceptible cultivars in southern and central Texas nurseries. In early June, traces of stem rust were found in plots and a field in east central Arkansas. During the second week in June, wheat stem rust severities ranged from trace to l% in fields of soft red winter wheat in southern Illinois, and in wheat plots in central Indiana. In late June, traces of stem rust were found on soft red winter wheat plants throughout southern Wisconsin and southern Michigan. In early July, stem rust severities were light to moderate in fields in south central Wisconsin. By late July, severely rusted fields of soft red winter wheat were observed in northwestern Illinois, northeastern Wisconsin and east central Michigan. In Indiana, the most stem rust was found since 1986 . In those northern soft red winter wheat areas where moisture conditions were good for the infection process to occur, there were significant losses to stem rust.

During the second week in June, traces of stem rust were observed in central and northeastern Kansas plots. The date of the first stem rust observation was two weeks later than normal for the northeastern Kansas location. During late June, wheat stem rust was found at trace-40% severities in plots and trace-l% severities in fields of susceptible cultivars in northern Kansas and southern Nebraska. The first stem rust infections in this area occurred when stem rust spore-laden rains fell in early June. The hot dry weather in mid-June in this area was not conducive for rust increase.

In mid-July, traces of wheat stem rust were found in plots and fields of winter wheat in southeastern South Dakota and east central North Dakota. At that time, traces of wheat stem rust were found also in plots of the susceptible spring wheat Baart in west central Minnesota, eastern South Dakota and central North Dakota. A more severe case of wheat stem rust, 20% severity, was observed on the susceptible spring wheat cultivar Max in a southeastern North Dakota plot. In mid-July, the durum cultivar, Mindum, which was released over 50 years ago, had traces of stem rust in plots in east central North Dakota. By mid-July, in an east central South Dakota nursery, some the of the late planted susceptible cultivars were destroyed by rust.

Several factors delayed stem rust development in the central Great Plains. First, stem rust overwintering in the southern Plains was less than normal. Then, cool, dry conditions in late winter in the southern Plains and hot dry weather in early June in the central plains were not conducive for rust increase. In spite of this, sufficient quantities of stem rust spores spread from the central Great Plains to initiate stem rust foci in susceptible spring wheat plots in the northern Great Plains. Stem rust from these foci developed normally. The stem rust resistance in the spring wheats remains highly effective in the northern plains. Without this highly developed stem rust resistance, spring wheats would have suffered significant losses throughout the northern plains.

By mid-July, hot spots (1-20% stem rust severities) were reported in winter wheat plots in the Palouse area of Washington. In mid-July, traces of stem rust were found on winter wheat in plots in western New York.

To date, race Pgt-TPMK is the predominant stem rust race identified in 1996 as it was in 1995 (Table 1). Presented in Table 1 are the preliminary wheat stem rust race identifications (many isolates will be rerun to confirm race identification).

TABLE 1. Preliminary identification of wheat stem rust races through August 14, 1996

	Number of		Number of isolates of Pgt race*							
State	collections	isolates	GFCS	GFBS	QCCS	QCCJ	QCMS	QFCS	RTRS	TPMK
AR	2	6								6
IL	5	15								15
IN	2	6			1					5
KS	14	40	4		1		6	5	3	21
LA	4	12								12
NE	7	21		1				2		18
TX	9	26	3			2		4		17

* Virulence formula:

GFCS - *Sr*21,8a,9g,17,9a,9d,10
QCMS - *Sr*5,21,9g,36,17,9a,9d,10
GFBS - *Sr*21,8a,9g,9a,9d,10
QFCS - *Sr*5,21,8a,9g,17,9a,9d,10
QCCS - *Sr*5,21,9g,17,9a,9d,10
RTRS - *Sr*5,21,7b,11,6,8a,9g,36,9b,17,9a,9d,10
QCCJ - *Sr*5,21,9g,17,9d,10
TPMK - *Sr*5,21,9e,7b,11,8a,9g,36,17,9d,10,Tmp

Wheat leaf rust. Southern Plains - Overwintering of leaf rust was lower than normal throughout most of the southern U.S. in 1995-96. During the last week in March, 20% leaf rust severities were observed on lower leaves of wheat plants in southern Texas fields and traces were observed in central Texas nursery plots. Generally, by late March, leaf rust was severe in nursery plots throughout southern Texas and moderate in central Texas, but the cool, dry weather kept the rust in check. By mid-April, leaf rust severities were lower than normal throughout the southern U. S. In southern Texas fields, rust was light and in southern Texas plots of susceptible cultivars, 40% severities were observed which is much less than normal. During the third week in April, no wheat leaf rust was observed in fields and plots in north central Texas. By the first week in May, 30% rust severities were observed on susceptible cultivars in central Texas nursery plots and traces were found in north central Texas fields (Fig. 1). During the third week in May, traces of leaf rust were found in south central Kansas and north central Oklahoma. In this area, leaf rust development was minimal because little or no rust overwintered and little rust inoculum arrived from areas farther south where drought conditions existed.

Central Plains -In contrast to the 1994-95 winter, when leaf rust overwintered throughout Kansas, very little rust overwintered in Kansas in 1995-96. In early June, traces of leaf rust were found in plots and fields of susceptible cultivars throughout Kansas. Most of the rust pustules were concentrated on upper leaves indicating that the rust developed from exogenous spore sources. During the third week in June, leaf rust was widespread throughout Kansas on wheat plants where there still was green tissue. Severities ranged from trace-5% on cultivars in plots and traces in fields in northeastern Kansas. The leaf rust loss estimate in Kansas in 1996 is less than 1% which is significantly less than the 5% loss in 1995. During the third week in June, 20-40% severities were found on susceptible wheat cultivars in east central Nebraska plots. In late June, 40% leaf rust severities were observed in a few fields and plots of susceptible cultivars in southern Nebraska. In this area, losses will vary with local conditions.

Northern Plains - On June 28, traces of wheat leaf rust were found in west central Minnesota, east central South Dakota and Winnipeg, Canada nurseries. This was two weeks later than the normal first date of observation of wheat leaf rust at these three locations. During early July, traces of leaf rust were found in spring wheat plots in central and east central North Dakota and traces in a winter wheat field in east central North Dakota. In mid-July, trace to 5% severities were common on flag leaves in plots and fields of winter wheat in east central and eastern South Dakota and southeast North Dakota winter wheat plots and fields. Leaf rust severities in the northern plains were much lower than normal this year, because leaf rust development in the southern and central plains was also much less than normal. Initial leaf rust development in the northern plains comes mainly from windborne spores from the south that are deposited with rains on wheat fields in the north. In mid-July, in susceptible spring wheat plots, trace-5% severities were common, while in spring wheat fields no leaf rust was observed in the northern Great Plains. By early August, in susceptible spring wheat plots, trace-10% severities were common. Due to resistance, only traces of leaf rust developed in commercial fields and therefore losses were minimal in spring wheats. No rust was reported on durum wheat.

Southeast - In the southeast U.S., during late March, leaf rust severities were generally light on susceptible southern soft red winter wheat in plots and fields. By mid-April, wheat leaf rust was severe in nursery plots in southeastern Louisiana and light in plots in the panhandle of Florida. By late April, leaf rust was severe on susceptible cultivars in nurseries and light in fields in central Louisiana and southern Georgia (Fig. 1). The winter rainfall in the Florida panhandle and southern Georgia was normal, creating favorable conditions for rust infection. Cool temperatures in February and March slowed rust development, but warm temperatures and moist conditions in early April were favorable for rust buildup. These rust infected plants provided leaf rust inoculum for wheats farther north. In late April, traces of leaf rust were found in an east central Arkansas field where leaf rust had survived the extremely cold winter. In mid-May, traces of leaf rust were reported in nurseries from east central North Carolina to east central Arkansas.

Midwest - In early June, light leaf rust was observed on soft red winter wheat from eastern Virginia to southern Illinois (Fig. 1). In mid-June, trace to 15% severities were observed in soft red winter wheat fields and nurseries at the soft dough stage throughout Indiana and Illinois. In the third week in June, traces of leaf rust were observed in fields in the Thumb area and central Michigan. In Michigan the leaf rust that developed was from spores that were deposited with rain from southern inoculum sources and not overwintering sources. In early July, leaf rust was severe in susceptible cultivars growing throughout Michigan.

California - During the last week in March, 15% leaf rust severities were reported on fall-sown spring wheat cultivars growing in nurseries and fields in the San Joaquin Valley in California. By the last week in April, moderate to severe leaf rust was found on wheat cultivars growing in nurseries and fields in the San Joaquin Valley in California (Fig. 1). By the first week in May, 60% leaf rust severities were reported on wheat cultivars growing in nurseries and in some fields in the Sacramento Valley in California. Generally, fields in the Sacramento Valley had moderate severities of leaf rust. Leaf rust losses on wheat occurred on the majority of cultivars throughout the state except for Express and RSI 5, which displayed excellent resistance.

Northwest - During mid-May, leaf rust was found throughout the state of Washington and the Columbia basin with 40% severities being reported on susceptible cultivars in nurseries. This was more severe leaf rust than normal for mid-May. In early June in the Pacific Northwest, wheat leaf rust was increasing rapidly. In central Washington, 90% severities were reported on susceptible cultivars and in the Palouse area of Washington, leaf rust was light to moderate. There was some spraying to control leaf rust on soft white wheat. An emergency label was obtained for the use of Folicur on wheat in Washington, because supplies of Bayleton ran low. Leaf rust development in eastern Oregon and Washington and northern Idaho was delayed by dry weather during early June, but rains in mid-June allowed for a rapid buildup of leaf rust in winter wheats in late June. Rains in eastern Washington and eastern Oregon during the last week in June created ideal conditions for rust increase and in mid-July, leaf rust was light to moderate in spring wheat plots. In the Pacific Northwest, the ideal moisture conditions for rust infection and endogenous rust inoculum created conditions for losses to leaf rust to occur in some areas.

Northeast - During the first week in July, leaf rust severities ranged from trace to 10% on winter wheats across the state of New York.

The wheat leaf rust races identified so far in the 1996 survey are presented in Table 2. All of the races identified were also found in 1995. Because of the light leaf rust this year, the rust collections that were made were less than one-half the normal number.

TABLE 2. Preliminary identification of wheat leaf rust races through August 14, 1996

Prt code	Virulence formula*	Number of isolates by state			
		GA	LA	TX	CA
MBB	1,3		2		
MBB-10	1,3,10		1		
MBG-10	1,3,10,11	1		2	
MBR-10	1,3,3Ka,10,11,30		2	5	
MCB-10	1,3,10,26				2
MCD-10	1,3,17,26		4	2	
MGB-10	1,3,10,16			2	
MLR-10,18	1,3,3Ka,9,10,11,18,30			2	
TBG-10	1,2a,2c,3,10,11		2		
TDB-10	1,2a,2c,3,10,24			2	
TDG-10	1,2a,2c,3,10,11,24			5	
TLG-18	1,2a,2c,3,9,11,18		2		
No. of Isolates		1	13	20	2
No. of Collections		1	8	12	2

* Single gene resistance evaluated:
*Lr*1,2a,2c,3,3Ka,9,10,11,16,17,18,24,26,30

Wheat stripe rust. By the second week in April, moderate severities of wheat stripe rust were observed in the San Joaquin Valley and traces were found in the Sacramento Valley of California. During early May, traces of wheat stripe rust were found in wheat fields in the Sacramento Valley in California.

By early May, wheat stripe rust was found throughout the state of Washington where environmental conditions were ideal for rust development. Sixty-percent severities were reported on susceptible cultivars in western Washington plots and 10% severities in eastern Washington plots. The earliest planted hard red winter wheat fields in central Washington were sprayed in early May for stripe rust control. By the third week in May, stripe rust was widespread throughout the Pacific Northwest and increased to epidemic levels on susceptible cultivars. The moist cool conditions this spring were ideal for rust development. By early June, wheat stripe rust was increasing. Stripe rust was found on spring wheats, but cultivars with adult plant resistance were not seriously damaged. Growers used large amounts of fungicide to control stripe rust on the susceptible cultivars of hard red and club wheats. Dry weather during the first 2 weeks of June delayed stripe rust development in eastern Oregon and Washington and northern Idaho. During early July, rust buildup on the soft white wheats was light since most of the major cultivars are resistant to stripe rust. In early July, stripe rust was severe in plots of susceptible winter wheat in the Palouse area of Washington, but stripe rust was not a problem in commercial fields with adult plant resistance. Stripe rust in the Pacific Northwest was severe this year and losses were greater than last year.

In early July, light amounts of stripe rust were detected in the Gallatin Valley in Montana, but hot, dry weather prevented further increase.

No wheat stripe rust was found in the central U.S. this year.

Oat stem rust. In mid-April, traces of oat stem rust were found in a nursery in southeastern Louisiana. Usually, by early April oat stem rust was severe in these plots, but the cooler than normal weather in March slowed the disease progress. By early May, 20-30% oat stem rust severities were observed on susceptible cultivars in central Louisiana, which was less than normal. In mid-May, trace to 80% rust severities were observed on oat cultivars in southern Louisiana plots.

In late April, traces of oat stem rust were found in nurseries in central Texas. During the last week in June, the first detection of oat stem rust in the central plains was traces of oat stem rust in north central Kansas fields. By mid-July, traces of oat stem rust were found in plots in south central Minnesota and southeastern South Dakota and in one field in southeastern South Dakota as well as on wild oats (*Avena fatua*) in southeastern North Dakota. In early August, traces of oat stem rust were found in plots in northwestern Minnesota and northeastern North Dakota. Much less oat stem rust has been found in the northern Great Plains the past two years than in previous years. The reduced amount of oat stem rust seems to be associated with a decline in oat production.

In early May, 30% rust severities were found on oats growing in plots and traces on wild oats in the Sacramento Valley in California.

Race NA-27, virulent to *Pg*-1,2,3,4, and 8 remains the predominant race of the oat stem rust population (Table 3).

TABLE 3. Preliminary identification of oat stem rust races through August 14, 1996

	Number of		Number of isolates of race*		
State	collections	isolates	NA-10	NA-16	NA-27
CA	2	4	4		
KS	1	3			3
LA	3	9		1	8
TX	10	27		3	24

* Virulence formula:

NA-10 Pg-2,3,15 NA-27 Pg-1,2,3,4,8
NA-16 Pg-1,3,8

Oat crown rust. During the last week in March, traces of crown rust were found in plots in southern Texas, but none was found in commercial fields. During mid-April, crown rust was light in southern

Texas fields and plots. In late April, crown rust was light in central Texas fields and plots. This area provided very little crown rust inoculum for oat-growing areas farther north.

By the second week in April, oat crown rust was found in a southeastern Louisiana nursery and 15% severities were reported in spreader rows. By early May, the severity of oat crown rust in central Louisiana was much less than normal.

During mid-May, light to moderate numbers of aecial infections were found on buckthorns growing in south central Wisconsin. Buckthorns are the alternate hosts for crown rust and generally provide the initial spores for crown rust infection of the northern oat crop. During the third week in May, light aecial infections were found in the St. Paul, Minnesota buckthorn nursery. By early June, light to moderate numbers of aecial infections were found on buckthorns growing in south central Minnesota and east central North Dakota. Aecial infections were 2 -3 weeks later than normal in this area. During the third week in June, traces of crown rust were found on oats in fields in south central Wisconsin and Iowa and in plots in south central Minnesota and east central South Dakota. Crown rust was beginning to build up on susceptible oat lines near buckthorn at the St. Paul, Minnesota, by early June. By early July, crown rust was light to moderate in southern Wisconsin and southern Minnesota oat fields. During the second week in July, traces of crown rust were found in a oat field in west central Minnesota and in the same field, 20% severities were found on wild oat plants. In mid-July, trace-40% crown rust severities were found on oat flag leaves in plots and fields throughout the Dakotas and southern Minnesota. In plots in southeastern South Dakota, 40% severities were common, while in central North Dakota plots, trace severities were common. On wild oats (*Avena fatua*), 20-40% severities were common in southeastern North Dakota fields. Crown rust was reported light to moderate in south central and southeastern Wisconsin. The most severe crown rust was found where rust occurred early and conditions were conducive for rust development. Buckthorn growing in close proximity to oat fields provided the initial inoculum in these areas, i.e., southeastern South Dakota and southern Minnesota. In early August, crown rust was severe in northern Wisconsin fields. Losses were more severe than last year in the northern oat-growing area with the latest planted fields suffering the most damage.

During mid-April, traces of crown rust were found on wild oats growing in the Sacramento Valley of California.

Barley stem rust. Barley stem rust was found for the first time this year in mid-July at trace amounts in plots in west central Minnesota, in a field in south central South Dakota and in plots and fields in southeastern North Dakota. Traces also were found on wild barley (*Hordeum jubatum*) growing on the roadside in northeastern South Dakota. In early August, traces of stem rust were found in plots and fields in eastern North Dakota. Much less barley stem rust was found in the northern plains than last year, which correlates to less wheat stem rust race QCCJ (the race which infects barley) being found as part of the stem rust population throughout the United States.

Barley leaf rust. By the last week in March, severe leaf rust caused by *Puccinia hordei* was observed in one plot in south Texas. In the other plots in the same nursery, lighter amounts were found. This year no barley leaf rust was found in eastern Virginia, which is unusual because barley leaf rust has overwintered there nearly every year. In early June, traces of barley leaf rust were found in plots in southern Illinois. During the second week in June, leaf rust was starting to increase in winter barley plots in Guelph, Canada, where it likely overwintered.

By the third week in June traces of barley leaf rust were found in southern Minnesota plots. In late June, traces of barley leaf rust were observed in plots in east central South Dakota and west central Minnesota. In early July, traces of leaf rust were found in a barley field in west central Minnesota. During mid-July, traces of barley leaf rust were found on wild barley (*Hordeum jubatum*) growing on the roadside in southern Minnesota and northeastern South Dakota.

This year losses to barley leaf rust were minimal in the United States.

Barley stripe rust. By the third week in March, barley stripe rust was found in Central Valley, Sacramento Co. and Sutter Co., California nurseries. By the last week in April, barley stripe rust was severe on susceptible cultivars growing in nurseries and fields in the San Joaquin and Sacramento valleys of California. Most of the released cultivars were susceptible to barley stripe rust, but some of the lines in the nursery were resistant to the rust.

In mid-April, barley was heavily infected with barley stripe rust in winter trial plots in northwestern Oregon at Corvallis. The rust first developed in susceptible border rows and then spread quickly to other cultivars in the plots. The most heavily rusted plants had 100% stripe rust on the bottom three leaves. By early May, stripe rust infection centers were observed in northeastern Oregon winter and spring barley varietal trials (Fig. 2). In early May, 40% severities were reported in eastern Washington barley plots. In mid-May, severe barley stripe rust was reported in experimental plots on the western side of the Cascades in Washington. In fields in eastern Washington, moderate levels of barley stripe rust were found. By early June, in the Pacific Northwest barley stripe rust severities as high as l00% were recorded in some western Washington winter barley plots. Traces of barley stripe rust were observed on spring barley in western Washington. In mid-June, stripe rust was severe on winter barley in irrigated plots in north central Oregon and in winter wheat plots and fields in northern Idaho and in southwest Idaho plots. An emergency label was obtained for use of Folicur to control stripe rust on barley in the Pacific Northwest. During the first week in July, stripe rust was increasing in spring barley fields and plots in northern Idaho and eastern Washington and in mid-July, rust was severe in susceptible cultivars in this area. In early August, light stripe rust was reported in a spring barley trial plot in the Flathead Valley of northern Montana. In the Pacific Northwest this year, a range in adult plant resistance was observed in different cultivars to barley stripe rust.

In 1996, severe barley stripe rust was reported from California and throughout Oregon and Washington Barley stripe rust is now firmly established in the Pacific Northwest, where the climate is most favorable for its development. As stated last year, this is a perfect example of a disease finding its niche and increasing at a fast rate over a large area.

Barley crown rust. In mid-June, 15% crown rust severities were reported on barley plants in an east central South Dakota nursery and by mid-July severities had reached 60%. In mid-July, trace to 25% barley crown rust severity readings were reported in barley plots and fields and wild barley in southeastern North Dakota.   By late July, severities reached 40% in susceptible cultivars in the North Dakota plots.

Rye stem rust.   In early August, traces of rye stem rust were found in a plot in west central Minnesota.

Rye leaf rust.   In late April, trace-10% rye leaf rust severities were observed in central Texas plots. During the third week of June, traces of rye leaf rust were found in southern Minnesota plots.   In early July, leaf rust was heavy on the lower leaves of rye plants in a west central Wisconsin field.   In mid-July, 20% rye leaf rust severities were observed in a plot of the spring rye cultivar Prolific in east central Minnesota.

Crown rust on Buckthorn.   During the second week in June, light to moderate aecial infections were found on buckthorn in east central Illinois, southern Minnesota and east central South Dakota. Due to the cool spring, infections on buckthorn appeared 2 to 3 weeks later than normal throughout this area. During the last week in June, a new wave of aecia were found on buckthorn growing in hedges in St. Paul, Minnesota. This is the latest that actively sporulating aecia were found on buckthorn in Minnesota in the last 8 years. Oats growing near these hedges were heavily infected with crown rust.

In mid-June, aecial development was severe in the Guelph, Canada, area and losses occurred in the latest maturing oat fields.

Stem rust on Barberry.   During mid-May, the aecial stage of stem rust was found on common barberry (*Berberis vulgaris*) bushes in south central Wisconsin. In early June, the aecial stage was found on common barberry in southeastern Minnesota.

This is the last issue of the Cereal Rust Bulletin for the 1995-96 growing season. I would like to thank all of those who helped with the bulletin this year, especially Mark Hughes who coordinates its distribution through the CRL web page (http://www.umn.edu/rustlab/), e-mail (markh@puccini.crl.umn.edu) and the post. As most universities and research facilities now have access to the Internet, we would like to use this system for exchanging information. Any reports of rust that you find in your area will be appreciated and this information will be added to the CRB and possibly our web page. My user name is davidl@puccini.crl.umn.edu.

As you no doubt know, all Federal Government agencies are reviewing their program priorities. If you feel that this publication and the related activities of the Cereal Rust Lab are important to you, you can help us by calling the USDA, ARS Midwest Area Director, Dr. Richard Dunkle, 1815 N. University Street, Peoria, IL 61604, phone# 309-681-6602 (E-mail: dunkler@ncaur1.ncaur.gov). Dr. Dunkle will be glad to discuss how you can make your feelings known in Washington. We thank those of you that have already taken the time to contact Dr. Dunkle.

Your comments on any aspect of the Cereal Rust Bulletin CRL web page are welcome.

David L. Long

Special Note:

This and previous 1994-96 rust bulletins can be viewed on the Cereal Rust Laboratory's web page (http://www.umn.edu/rustlab). Several summary statements of the cereal rust situation in specific regions this year have been provided by cooperators in those regions. The reports can be found on our web page under the Cereal Rust: Bulletins, Updates section.

Fig. 1. Leaf rust severities in wheat fields in 1996

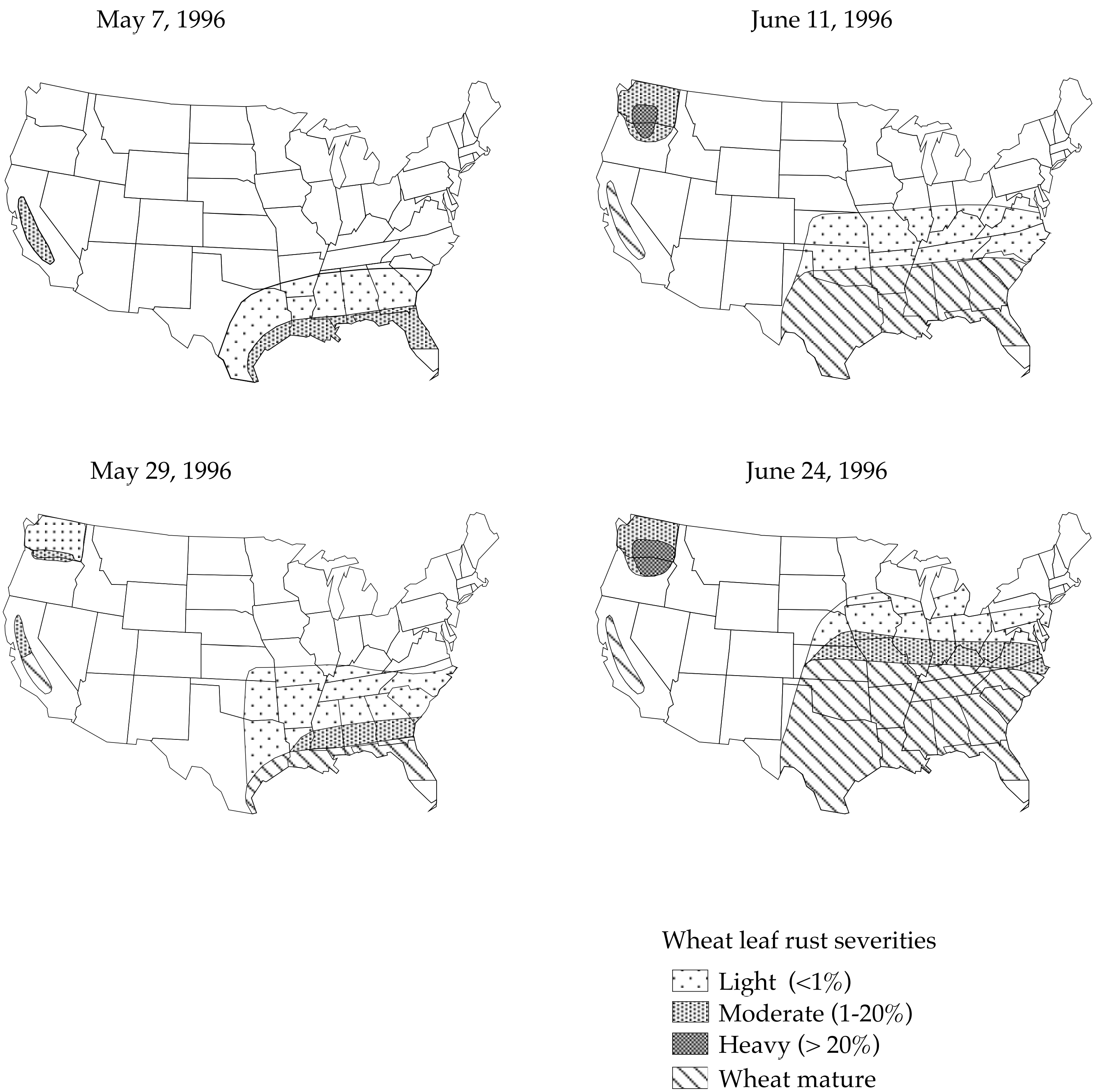

Fig. 2. Reported distribution of barley stripe rust in 1996